

WHAT IS CLAIMED IS:

1. A method for making a thin-film semiconductor device including a semiconductor film having a source region, a channel region, and a drain region, a gate electrode opposing the semiconductor film and a gate-insulating film disposed between the semiconductor film and the gate electrode, the source region and the drain region further including a region with a relatively high impurity concentration and a region with a relatively low impurity concentration, respectively, the method including the steps of:

forming a semiconductor film with a predetermined pattern on a substrate;

forming a gate-insulating film on the semiconductor film;

forming a tapered gate electrode on the gate-insulating film;

implanting a low concentration of impurity into the semiconductor film through the gate electrode functioning as a mask;

forming a layer insulating film composed of at least two different insulating layers on the gate electrode on the substrate;

etching an entire surface of the layered insulating film to form a predetermined pattern in at least one of layer of the layered insulating film, the predetermined pattern having a width greater than a width of the gate electrode and smaller than a width of the semiconductor film; and

implanting a high concentration of impurity through the layered insulating film formed according to a predetermined pattern functioning as a mask.

2. The method for making a thin film semiconductor device according to claim 1, an uppermost layer of the layered insulating film being isotropically formed in the step of forming a layered insulating film and the entire surface of the layered insulating film being anisotropically etched in the step of etching the layered insulating film.

3. The method for making a thin film semiconductor device according to claim 2, anisotropic etching being performed after forming a predetermined pattern in at least one of the layers of the layered insulating film, the predetermined pattern having a width greater than the width of the gate electrode and smaller than the width of the semiconductor film.

4. The method for making a thin film semiconductor device according to claim 1, an uppermost insulating layer of the layered insulating film and the gate-insulating film having substantially a same composition.

5. The method for making a thin film semiconductor device according to claim 1, an endpoint of etching for an uppermost insulating layer of the layered insulating film

controls a volume of the insulating film remaining in a vicinity of the gate electrode being controlled in the step of etching the layered insulating film.

6. The method for making a thin film semiconductor device according to claim 1, an etching rate of an upper insulating layer being greater than an etching rate of a lower insulating layer and an etching rate of the exposed lower insulating layer being greater than an etching rate of the upper insulating layer in the step of etching the layered insulating film.

7. The method for making a thin film semiconductor device according to claim 1, the gate-insulating film being composed of silicon oxide.

8. The method for making a thin film semiconductor device according to claim 7, the layered insulating film further comprising a first insulating layer composed of silicon nitride and a second insulating layer composed of silicon oxide on the first insulating film.

9. A thin film semiconductor device made by the method for making a thin film semiconductor device according to claim 1,

the insulating film being formed at least along sides of the gate electrode, and each of the source region and the drain region of the semiconductor having a low concentration region corresponding to a portion of the insulating film with a width greater than the gate electrode.

10. A method for making an electro-optic apparatus having a thin-film semiconductor device including a semiconductor film having a source region, a channel region, and a drain region, a gate electrode opposing the semiconductor film, and a gate-insulating film disposed between the semiconductor film and the gate electrode, the source region and the drain region including a region with a relatively high impurity concentration and a region with a relatively low impurity concentration, respectively, the method comprising the steps of:

forming a semiconductor film with a predetermined pattern on a substrate;

forming a gate-insulating film on the semiconductor film;

forming a tapered gate electrode on the gate-insulating film;

implanting a low concentration of impurity into the semiconductor film

through the gate electrode functioning as a mask;

forming a layered insulating film composed of at least two different insulating layers on gate electrode on the substrate;

etching an entire surface of the layered insulating film to form a predetermined pattern in at least one of the layers of the layered insulating film, the predetermined pattern

having a width greater than the width of the gate electrode and smaller than the width of the semiconductor film; and

implanting a high concentration of impurity into the semiconductor film through the layered insulating film formed according to a predetermined pattern functioning as a mask.

11. An electro-optic apparatus made by the method according to claim 10, the insulating film being formed at least along sides of the gate electrode, and each of the source region and the drain region of the semiconductor film having a low concentration region corresponding to the portion of the layered insulating film with a width greater than the gate electrode.

12. An electronic apparatus including the electro-optic apparatus according to claim 11.